artery did not preclude direct connection to the right-sided inferior vena cava. This patient also had a previously performed bidirectional superior vena cava–pulmonary artery anastomosis, which did not preclude mobilization of the pulmonary arteries and direct connection. We agree with Di Carlo, Carotti, and Amodeo that extensive mobilization of both branch pulmonary arteries (and the superior vena cava–pulmonary connection, if present) must be performed to facilitate the procedure.

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12/8/79334

Deep sternal wound infection after sternotomy

Reply to the Editor:

We read with interest the article by The Parisian Mediastinitis Study Group, "Risk Factors for Deep Sternal Wound Infection After Sternotomy: A Prospective Multicenter Study" (J Thorac Cardiovasc Surg 1996;111: 1200-7). The study coordinators are to be commended for their thorough and comprehensive work. However, their findings are surprising and deserve several comments.

Among 960 patients operated on for coronary artery bypass grafting (CABG) in 10 cardiac surgical units, 32 patients had a deep sternal wound infection (DSWI) for an incidence of 3.3%. Among these patients, 126 underwent bilateral internal thoracic artery (ITA) grafting, and a DSWI developed in 11 of these patients (8.7%). By multivariate analysis, among other risk factors, bilateral ITA grafting was a significant independent predictor for postoperative DSWI (odds ratio 4.2, 75% confidence interval 1.9 to 9.2, $p = 0.0003$).

The astonishingly high rate of DSWIs after bilateral ITA in this multicenter study is particularly distressing because the combined mortality and morbidity of this dreadful complication would neutralize the potential benefits of double ITA.

Although the authors have used strict definition criteria, it is not clear how the diagnosis of DSWI was made in the 10 patients who did not undergo reoperation, nor is it clear how they were treated.

The authors consider this high incidence of mediastinitis to be due to the prospective data collection and more stringent definition of wound infection. They also state that preoperative risk score assessment for DSWI, change in operating room tactics, and better patient selection for bilateral ITA could decrease the incidence of DSWI. However, they fail to mention the guidelines used for double ITA grafting in the various centers.

Risk factors for mediastinitis are multiple and widely known.[1-3] Patient-related risk factors like obesity or diabetes cannot be modified. However, procedure-related variables like operating room policies and operative techniques can be changed, with a rewarding influence on results.

Among 450 consecutive patients undergoing CABG with double ITA grafting in a single center, we observed three DSWIs (0.66%) using the criteria of the Centers for Disease Control and Prevention. Double ITA was performed in 45% of the total population of patients undergoing CABG. Contraindications for bilateral ITA were age older than 70 years, urgent revascularization, and association of diabetes and obesity. No mediastinitis occurred in the 54 patients with diabetes (11.8%). ITAs were harvested by the senior surgeon, always using skeletonization with no electrocautery.

If DSWIs after CABG are to be reduced to acceptable levels and our patients are still to benefit from the advantages of two thoracic arteries, ITA harvesting technique, operative time, and method of sternal closure are among some of the surgically induced risk factors for mediastinitis that should be addressed.

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12/8/79786

Reply to the Editor:

The comments by Sousa Uva, Fischer, and Bical regarding the high frequency of deep sternal wound infections (DSWIs) after bilateral internal thoracic artery (ITA) grafting in our study deserve several answers.

Surveillance methods and definition of sternal infection in our study may partly explain the high ratio of DSWI. As indicated in the article, the prospective collection of DSWIs and prolonged surveillance after hospital discharge usually lead to a more sensitive and accurate detection of events in such risk factor studies. Specifically, risk of DSWI after bilateral ITA grafting was 1.5% to 3.8% in five retrospective studies[1-5] and was 6.9% in one prospective study.[6]

You raise the question of diagnosis of DSWI in the absence of sternal wound débridement. Indeed, the definition proposed by the Centers for Disease Control and Prevention relies on anatomic and clinical criteria. Ten of 42 sternal wound infections were limited to superficial sternal bone and were considered DSWIs. These patients did not undergo a reoperation, instead receiving local treatments.

Criteria for bilateral ITA grafting in the 10 centers were

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not known. However, 16 of the 126 (16%) patients who underwent bilateral ITA grafting were diabetic; 53 (42%) had moderate obesity (25 < body mass index ≤ 30) and 22 (17%) had morbid obesity (body mass index > 30); and 14 (11%) were older than 70 years. Applying the criteria currently in use in the Saint Joseph Hospital, 36 patients would have been excluded from bilateral ITA grafting and five of 11 DSWIs would have been avoided. Further studies, as recently exemplified by He and associates,[2] are warranted to better define the population that would benefit from bilateral ITA grafting, together with low risks of DSWI. We fully agree that better perioperative techniques, especially operating room policies, would reduce the occurrence of DSWI in these high-risk patients.

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12/8/79784

Materials for tracheoplasty: Which work? Which are best?

To The Editor:

We read with interest the report by Niwa and associates[1] of their clinical experience in infants and adults undergoing esophageal tracheobronchoplasty for a variety of congenital and acquired tracheal lesions. In their discussion these authors expressed the view that on occasion homologous pericardium may not be strong enough to serve as patch material for tracheoplasty procedures.

At the risk of overestimating the values of anecdotal observations, we can report that lyophilized homograft pulmonary artery patches have been used in two infants undergoing anterior tracheoplasties. These patients, aged 5 and 3 months, required simultaneous correction of congenital heart lesions (interrupted aortic arch type B with ventricular septal defect and pulmonary artery sling, respectively). These procedures were done according to methods and management protocols previously described by others.[2-4] In addition, fibrin sealant was used for suture-line sealing.

In both of these patients, progress has been satisfactory over intervals of 3¾ and 2¾ years, respectively. Bronchoscopies were done at 1½ year and 2 years in the first patient and at 1 years in the second. These studies showed slight tracheal irregularity, no stenosis, and apparent epithelialization (biopsies not done) (patches were placed adventitia outward). Faint calcifications in the region of these patches appeared by 6 to 12 months on chest x-ray films.

As the authors noted in their discussion, several patch materials can "work" on tracheoplasty procedures. In infants similar to those described here, perhaps lyophilized pulmonary artery homograft can be added to the list. However, it remains to be determined which material is best and in what circumstances. For this reason, we appreciated this report of esophageal tracheobronchoplasty and note the need for further investigations in this area.

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12/8/78756

Mini-T sternotomy for cardiac operations

To the Editor:

A wave of enthusiasm has recently arisen for the use of minimally invasive techniques for cardiac surgery. Some of these techniques include small incisions that have the disadvantage of providing limited exposure.[1] I initially used a T-shaped low sternotomy on a patient who had a tracheostomy, and I have extended its use to other patients after appreciating its multiple advantages compared with other "mini" incisions.

The vertical skin incision extends from the xiphoid to below the angle of Louis. The midline sternotomy starts just to the side of the xiphoid and extends to the level of the second intercostal space, where it is "T'd" to the left and right, care taken to avoid injury to the intercostal pedicles (Fig. 1).

A standard sternal retractor is inserted and exposure of the ascending aorta is enhanced by lifting the manubrium with one of the arms of a Rultrac retractor (Rultrac, Inc., Mentor, Ohio) (Fig. 2), which is conveniently placed high, near the patient's left shoulder and away from the assist-